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Optics Transport and Delivery for the National Ignition Facility Project*

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Preferred Presentation: Oral Presentation,
but also willing to do poster presentation

This paper will discuss the functional challenges, the innovate design approaches, and the hardware prototypes required for Optics transport and handling for the NIF Project. We will also discuss how the lessons learned and data acquired from the Amplifier Maintenance Transport Prototype Vehicle has influenced the design for handling all 20 of the laser bay 4x1 optic LRU's. The NIF Project Title 1 designs will provide a foundation for this presentation.

The National Ignition Facility has an aggressive schedule for initial installation and activation of the multi-pass, 192 beam, high power, neodymium-glass laser. To accommodate this schedule the Operations Engineering team must rapidly assembly and align large aperture optics into line replaceable units (LRU's). Once assembled and aligned these LRU's must be carefully transported, docked and inserted into the beamline. For long term operations the Operations Engineering team must meet and ensure the beamline operations schedule with rapid removal and replacement of optics while maintaining cleanliness, minimizing particle generation, and preserving optics assembly alignment. To meet these project goals there are significant design challenges the Operations Engineering team must successfully address.

One of those significant challenges facing the Operations Engineering team is the bottom loading transport and handling of the 4 high by 1 wide optics columns, know as the optics line replaceable units (LRU's) into the NIF laser bays. There are twenty different optic LRU's on each of the 192 beamlines ranging from 80kg to 900kg in weight and from 1800mm to 2800mm in height.

We are aggressively pursuing a single bottom loading and delivery system design that is optimized on requirements and attributes that are common to all 20 LRU's while accommodating the individual optic LRU differences. Commonality between the optics LRU's include stringent vibration and stability requirements, maintenance of a class 100 environment from initial assembly through beamline operation, commonality in cavity and transport level optics assembly designs, and consistent bundle spacing. Differences that are accommodated in the design include the differences in the weight and height of individual LRU's, the differences in footprints and insertion envelopes, and the differences in travel distances. The Bottom loading delivery system will employ common clean canisters that house the LRU's, and modular lifting/insertions subassemblies. The canisters will be configured to dock and seal to the specific beam enclosures while maintaining cleanliness and environmental conditions.

The bottom loaded amplifier cassette cart being designed by the Lasers CS&T Program will be tested in the AMPLAB/LABAMP this fall. This is a key R&D system for testing the overall concept of LRU insertion and removal while providing high levels of cleanliness in the operational mode very similar to that expected in NIF. This unit will provide valuable data and experience to support the NIF transport and delivery systems.

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